Best Practices for After-School Programs in Reading, Writing, Math, and Science

Because after-school programs have typically focused on non-academic indicators of success, there is little research regarding the most effective academic practices in out-of-school settings. Our prior briefing paper, *Fifteen Strategies of Successful After-School Programs*, detailed many of the elements that characterize effective community programming across the board. This paper expands on that list to isolate specific best practices in four primary disciplines: reading, writing, math, and science. Although research on discipline-specific best practices is extremely limited, this document compiles available research on both classroom-based and after-school programming to extrapolate the key elements of successful programs in each subject area.

It should be noted that most research about effective academic strategies focuses on curriculum and/or standards, not on pedagogical methods. Out-of-school programs will be challenged to align their activity to reinforce school curriculum, while also taking advantage of their non-school structures.

While there is no single correct approach to programming in any of the academic disciplines, the available research does emphasize several overarching practices used by effective programs across all four subjects. These include:

- **Student engagement.** The most effective programs in all subject areas create environments and activities that engage *all* participants in learning. In the most effective programs and classrooms, virtually all students are participating and engaged in the work at hand.
- **Small group instruction.** Small group instruction has been found to be an important contributing factor in successful academic programming. Working with small groups encourages collaborative learning and allows instructors to more appropriately tailor assistance for each student.
- **Emphasizing specific academic priorities.** Both in-school and out-of-school research highlight the importance of being more intentional about a program's emphasis on a particular subject (whether it be reading, writing, math, or science) – clearly stating goals, clarifying instructional methods, and articulating high expectations for participants. Programs can use many different curricular elements, including a variety of materials and technologies, but they must still maintain a clear priority on their subject matter.
- **Balanced approach.** At the same time that programs emphasize specific academic priorities, they must also balance this focus to address and develop all of the needs of children, not just academics. After-school programs must not simply be "school after school" – they must encourage children's social, cultural, emotional, and physical development as well.

In addition to these overarching characteristics, research also suggests several key elements that can be identified as critical to student success in each of the four major fields of study, beyond obvious subject-specific curricular differences.

Reading
Research suggests that the activity of reading aloud to children is the single greatest influence on their later reading achievement. But other supervised and independent opportunities for students to practice reading are also critical. In this way, out-of-school reading experiences provide an important component of a child's literacy development. When children's out-of-school curriculum exposes them to an environment rich in language and print, they typically show improved academic performance. Students need the opportunity to develop their literacy skills through reading with coaching, discussions with adults and peers, storytelling, reading and listening exercises, games, and other activities that extend learning beyond the regular school day.

In particular, it is important for youth to have frequent opportunities to apply the lessons of classroom instruction to everyday reading activities, such as time spent on independent reading, guided reading, reading aloud with feedback, and conversations about texts that have been read. Successful programs also extend reading activities into the home, involving parents in their children's reading and encouraging literacy-related experiences at home.

Writing
As with reading, the opportunity for applied practice has been found to be a key to improving children's writing achievement. Chances to write must extend beyond English class, and students must learn to write for many audiences and on many subjects. In particular, children should be encouraged to write in "real" situations where writing emerges naturally out of other activities, such as class projects, list-making, games, journal-writing, and copying texts and lyrics.

Feedback is also important to the success of writing programs. Supervised writing opportunities with delayed or "as needed" instruction on grammar have been cited as key practices of effective writing programs. Other forms of non-threatening evaluation, including peer review, are also important, as is an emphasis on the process of revision, rather than correction.

Math
Although the research on strategies for teaching mathematics has largely been divided between an emphasis on specific skill building and more concept-based approaches, most research agrees that effective teaching should focus on several key processes. Programs should provide a balance of instruction on mathematical concept development, reasoning, problem solving, skills practice, and communication of math concepts and skills. Many programs also emphasize cooperative learning processes that allow students to work together to actively explore mathematical concepts, to practice and reinforce skills, and to develop mathematical thinking and communication.

Science
Best practice in science instruction focuses on providing students with hands-on, interactive activities and opportunities for inquiry-based learning. Inquiry-based learning introduces students to a process by which they pose questions about the natural world and investigate the queries in order to develop a more complete understanding of scientific concepts, principles, models, and theories. To support this type of learning, successful programs should: 1) actively encourage and model the practice of scientific inquiry; 2) structure and align the program environment, resources, and time to facilitate scientific inquiry; 3) support cooperative and collaborative learning and encourage oral and written discourse about scientific ideas; and 4) connect science to other school subjects, including mathematics.

Resources for subject-specific academic programming

Most of the following resources for best practices in academic programming are directed toward school teachers and school programs. Contact individual resources to see what options they have for out-of-school programs.

READING

Center for the Improvement of Early Reading Achievement (CIERA)
CIERA provides information on early literacy instruction and effective strategies for teaching reading. They offer a range of resources, including a Summer Institute to help educators design early literacy programs based on current research.
www.ciera.org

Developmental Studies Center: Reading, Thinking, & Caring (K-3) and Reading for Real (4-8)
The Reading, Thinking, & Caring and Reading for Real programs provide curriculum and resources for reading instruction centered around "real" reading and discussion of age-appropriate classic and modern literature. The Developmental Studies Center is also currently in the process of adapting school curriculums to out-of-school settings in its After-School Literature project.
http://www.devstu.org/materials.html#Reading_Thinking_and_Caring

WRITING

National Writing Project
The National Writing Project aims to improve the teaching of writing and improve learning in the nation's schools. Through its professional development model, the National Writing Project helps teachers to use effective approaches to writing instruction.
http://www-gse.berkeley.edu/research/nwp/

MATHEMATICS

MathWings
MathWings is a school math curriculum developed by Johns Hopkins University that is based on the most up-to-date research in effective mathematics instruction and cooperative learning. It actively involves students in learning and communicating about mathematics and balances the development of mathematical concepts and the maintenance of mathematics skills through real-world problem solving exercises.
http://www.successforall.net/curriculum/mathwings.htm

Developmental Studies Center: Number Power
Number Power uses a collaborative approach to the teaching of mathematics that combines hands-on experiences, role playing, problem solving, and reflection to help kids work together to improve their understanding of math concepts and concrete skills.
http://www.devstu.org/materials.html#Number_Power

SCIENCE

Lawrence Hall of Science: Full Option Science System (FOSS)
FOSS is an elementary school science program developed at the Lawrence Hall of Science with support from the National Science Foundation. FOSS program materials are designed to meet the challenge of providing meaningful science education for all students in diverse American classrooms and to prepare them for life in the 21st century. FOSS incorporates time-honored methodologies such as hands-on inquiry and interdisciplinary projects with contemporary methodologies as multisensory observation and collaborative learning groups.
http://www.lhs.berkeley.edu/FOSS/

The Exploratorium Institute for Inquiry
Created in response to widespread interest in inquiry-based science instruction, Institute for Inquiry programs are crafted to provide science educators with a forum for exploring, examining, and discussing the nature of inquiry. Institute programs are designed to enable teachers, schools, and districts to increase their capacity for providing quality science instruction.
http://www.exploratorium.com/IFI/index.html

Selected Other Resources

Reading

Partnership for Family Involvement in Education (1998). *Safe and Smart: Making the After-School Hours Work for Kids.* Washington, DC: U.S. Department of Education and U.S. Department of Justice. http://www.ed.gov/pubs/SafeandSmart.

Taylor, B., Pearson, P.D., Clark, K., and Walpole, S (1999). *Beating the Odds in Teaching All Children to Read: Lessons from Effective Schools and Exemplary Teachers.* Ann Arbor, MI: Center for the Improvement of Early Reading Achievement (CIERA). http://www.ciera.org/ciera/publications/report-series/inquiry-2/2-006.pdf.

CIERA (1998). *Improving the Reading Achievement of America's Children: 10 Research-Based Principles.* Ann Arbor, MI: : Center for the Improvement of Early Reading Achievement. http://www.ciera.org/ciera/information/principles/10prin01.pdf.

Writing

Holbrook, H.T. (1985). *Qualities of Effective Writing Programs.* ERIC Digest. Urbana, IL: ERIC Clearinghouse on Reading and Communications Skills. www.ed.gov/databases/ERIC_Digests/ed250694.html.

Office of Educational Research and Improvement (1993). *Help Your Child Learn to Write Well.* Washington, DC: U.S. Department of Education. www.ed.gov/pubs/parents/Writing/index.html.

Mathematics

National Council of Teachers of Mathematics (1998). *NCTM Principles and Standards for School Mathematics*, Electronic discussion draft. http://standards-e.nctm.org/.

Madden, N., Slavin, R., Simons, K. (1999). *MathWings: Effects on Student Mathematics Performance*. Baltimore, MD: Center for Research on the Education of Students Placed at Risk, Johns Hopkins University. http://www.csos.jhu.edu/crespar/Reports/report39.pdf.

Science

Institute for Inquiry (1999). *Inquiry: Thoughts, Views, and Strategies for the K-5 Classroom.* Foundations monograph series, volume 2. National Science Foundation. http://www.nsf.gov/pubs/2000/nsf99148/htmstart.htm.

National Research Council (1996). *National Science Education Standards.* Washington, DC. National Academy Press. http://www.nap.edu/readingroom/books/nses/html/

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